

CONTENTS ACQUIRING DEVICE, CONTENTS ACQUIRING METHOD,
CONTENTS SERVER AND CONTENTS ACQUIRING SYSTEM

BACKGROUND OF THE INVENTION

5 The present invention relates to a contents acquiring device for acquiring contents data stored in various contents servers, a contents acquiring method, a contents server and a contents acquiring system, and more particularly relates to a contents acquiring device capable of acquiring contents data
10 stored in a cache section provided in the device in place of the contents data stored in the contents server.

 In recent years, a semiconductor technology, a communication technology and the like have been developed. Therefore, it is possible to access a server on an internet
15 through a leased line or a public telecommunication network and to receive provision of various contents services by using a personal computer or a portable telephone in a general home as a client. However, it takes a time to access various contents data through a communication line having a low data transfer
20 speed in the public communication network or the like, and the number of internet users has been rapidly increased so that a throughput has been reduced. For this reason, it has been desirable that the capacity of a server for preparing a network and storing contents should be enhanced.

25 As one of countermeasures to avoid such a situation, a cache is provided in a contents acquiring device for acquiring various contents data. Referring to the contents data which are not required to access a contents server on the internet,

data are fetched from the cache, thereby reducing data access through a network infra.

Fig. 1 shows the summary of the structure of a contents acquiring system to which the contents acquiring device for acquiring such contents data is applied. The contents acquiring system comprises a contents acquiring device group 15 including a personal computer 10, an information portable terminal for managing a game terminal or personal information (Personal Digital Assistants: hereinafter referred to as a PDA) 11, a laptop computer 13 having a mobile communication terminal 12 such as a personal handy-phone system (hereinafter referred to as a PHS) or a portable telephone connected as a communication interface apparatus, a portable telephone 14 having a browser function and the like, a contents server group 17 including first to Nth contents servers 16₁ to 16_N for storing various contents data in a variety of fields are connected through a network 18 including a public communication network or a leased line.

For example, in a browser to be a contents data reading program which is operated by the personal computer 10, a URL (Uniform Resource Locator) for specifying various information resources such as desirable contents data is specified and desirable contents data are acquired from the contents server corresponding to the specified URL through a network infra 19 having the network 18. Based on the browser function of the portable telephone 14, moreover, the contents data are acquired from the contents server corresponding to the specified URL through a radio base station 20 for carrying out radio

communication with the mobile communication terminal 12 and the portable telephone 14 and the network infra 19 comprising the network 18.

Each contents acquiring device in the contents acquiring device group 15 is constituted by the following sections.

Fig. 2 illustrates the summary of the structure of the contents acquiring device. The contents acquiring device comprises an input section 25 for accepting various requests sent from a device user, an external input/output section 26 having an interface function together with the network infra 19, a display section 27 for displaying contents data acquired by the external input/output section 26, a cache section 28 for temporarily storing the contents data, a timer section 29 for timing an update time of the contents data stored in the cache section 28, and a control section 30 for controlling each section of the device.

Since the contents acquiring device has the cache function of the contents data, the contents once accessed can be fetched and read without the network infra 19. The contents data stored in the cache section 28 are properly updated based on access information such as a valid term or a final update date which is added to the contents data. Thus, the newest contents data are provided to the user without the network infra 19 as much as possible.

The control section 30 of the contents acquiring device carrying out such control executes various processings in accordance with a control program stored in a memory which is not shown, for example.

Fig. 15 shows the summary of processing contents of the control program to be executed by the control section of the conventional contents acquiring device. When the control section 30 accepts the input of various device operation information from the device user through the input section 25 (Step S35), it first analyzes the device operation information thus accepted (Step S36). As a result of the analysis, when the device operation information sent from the device user is a request for acquiring contents (Step S37: Y), a predetermined contents acquiring processing is carried out (Step S38) and a series of processings are ended (End). Moreover, when the device operation information sent from the device user is not the request for acquiring the contents as a result of the analysis (Step S37: N), a processing corresponding to other various operation information thus analyzed is carried out (Step S39) and a series of processings are ended (End).

Figs. 16 to 19 show the summary of processing contents of the contents acquiring processing of the Step S38 in Fig. 15. The control section 30 further analyzes the request for contents acquisition which is accepted by the input section 25 and specifies the requested contents data, and retrieves the cache section 28 to decide whether or not there are the requested contents data (Step S40). When it is decided that there are not the contents data requested to be acquired by the cache section 28 (Step S40: N), an instruction for transmitting a request for acquiring the contents data is given to the external input/output section 26 (Step S41). The external input/output section 26 transmits a contents acquisition request in response

to the instruction given from the control section 30, through the network infra 19 to the contents server for storing contents data acquired and requested.

The external input/output section 26 monitors the normal receipt of the contents data from the contents server to be a contents request destination through the network infra 19, and transfers the received contents data to the control section 30 when detecting the normal receipt. When the control section 30 acquires the contents data normally received by the external input/output section 26 (Step S42: Y), it updates the cache section 28 by using the acquired contents (Step S43) and gives an instruction for displaying the received contents to the display section 27 (Step S44). The display section 27 displays the received contents in response to the instruction given from the control section 30. Then, a series of processings are ended (End).

On the other hand, when the external input/output section 26 cannot receive the contents data from the contents server to be the acquisition request destination through the network infra 19 and the control section 30 cannot acquire the contents data (Step S42: N), the control section 30 deletes the contents stored in the cache section 28 and gives the display section 27 an instruction to display of contents acquisition failure (Step S45). The display section 27 gives an instruction of the contents acquisition failure in response to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When it is decided that the cache section 28 has the

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not updated after the final update date as a result of the analysis carried out according to the response sent from the contents server, for example, at the Step S53 (Step S53: N), the control section 30 deletes the contents stored in the cache section 28 (Step S55) and gives an instruction for displaying contents acquisition failure to the display section 27 (Step S56). The display section 27 displays the contents acquisition failure in response to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When the valid term is not added to the contents stored in the cache section 28 at the Step S46 (Step S46: N), the control section 30 gives the external input/output section 26 an instruction for transmitting a contents acquisition request on condition that the contents stored in the cache section 28 are updated after the date that the contents are acquired (Step S57). The contents acquisition request is valid only when the contents stored in the cache section 28 are updated after the date that the contents are acquired in the contents server. The external input/output section 26 transmits such a contents acquisition request in response to the instruction sent from the control section 30.

The external input/output section 26 monitors the normal receipt of the contents data from the contents server to be a contents request destination through the network infra 19, and transfers the received contents data to the control section 30 when detecting the normal receipt. When the control section 30 acquires the contents data normally received by the external input/output section 26 (Step S58: Y), it updates the cache

section 28 by using the acquired contents (Step S59) and gives an instruction for displaying the received contents to the display section 27 (Step S60). The display section 27 displays the received contents in response to the instruction given from the control section 30. Then, a series of processings are ended (END).

On the other hand, when the external input/output section 26 cannot receive the contents data from the contents server to be the acquisition request destination through the network infra 19 and the control section 30 cannot acquire the contents data at the Step S58 (Step S58: N), the reason why the contents cannot be acquired is analyzed. For example, a response sent from the contents server is analyzed. For example, when the reason why the contents data cannot be acquired is that the contents on the contents server side are not updated after the date that the contents stored in the cache section 28 are acquired as a result of the analysis carried out according to the response from the contents server, for example, (Step S61: Y), the control section 30 fetches the contents previously acquired by the cache section 28 and gives the display section 27 an instruction to display the contents (Step S62). The display section 27 displays the contents according to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When the contents data cannot be acquired for another reason except that the contents on the contents server side are not updated after the date that the contents stored in the cache section 28 are acquired as a result of the analysis carried out

according to the response sent from the contents server, for example, at the Step S53 (Step S61: N), the control section 30 deletes the contents stored in the cache section 28 (Step S63) and gives an instruction for displaying contents acquisition failure to the display section 27 (Step S64). The display section 27 displays the contents acquisition failure in response to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When it is decided that the current time obtained by the timer section 29 does not expire the valid term added to the contents at the Step S47 (Step S47: N), the control section 30 fetches the contents previously acquired by the cache section 28 and gives the display section 27 an instruction to display the contents (Step S65). The display section 27 displays the contents in response to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When the final update date is not added to the contents stored in the cache section 28 at the Step S48 (Step S48: N), the control section 30 gives the external input/output section 26 an instruction for transmitting a contents acquisition request on condition that the contents stored in the cache section 28 are updated after the valid term added to the contents stored in the cache section 28 (Step S66). The contents acquisition request is valid only when the contents stored in the cache section 28 are updated after the valid term added to the contents added to the cache section 28. The external input/output section 26 transmits such a contents acquisition request in response to the instruction sent from the control section 30.

The external input/output section 26 monitors the normal receipt of the contents data from the contents server to be a contents request destination through the network infra 19, and transfers the received contents data to the control section 30 when detecting the normal receipt. When the control section 30 acquires the contents data normally received by the external input/output section 26 (Step S67: Y), it updates the cache section 28 by using the acquired contents (Step S68) and gives an instruction for displaying the received contents to the display section 27 (Step S69). The display section 27 displays the received contents in response to the instruction given from the control section 30. Then, a series of processings are ended (END).

On the other hand, when the external input/output section 26 cannot receive the contents data from the contents server to be the acquisition request destination through the network infra 19 and the control section 30 cannot acquire the contents data at the Step S67 (Step S67: N), the reason why the contents cannot be acquired is analyzed. For example, a response sent from the contents server is analyzed. For example, when the reason why the contents data cannot be acquired is that the contents on the contents server side are not updated after the valid term added to the contents stored in the cache section 28 are acquired as a result of the analysis carried out according to the response from the contents server, for example, (Step S70: Y), the control section 30 fetches the contents previously acquired by the cache section 28 and gives the display section 27 an instruction to display the contents.

(Step S71). The display section 27 displays the contents according to the instruction sent from the control section 30. Then, a series of processings are ended (END).

When the contents data cannot be acquired for another
5 reason except that the contents on the contents server side are not updated after the valid term added to the contents stored in the cache section 28 are acquired as a result of the analysis carried out according to the response sent from the contents server, for example, at the Step S70 (Step S70: N), the control
10 section 30 deletes the contents stored in the cache section 28 (Step S72) and gives an instruction for displaying contents acquisition failure to the display section 27 (Step S73). The display section 27 displays the contents acquisition failure in response to the instruction sent from the control section 30.
15 Then, a series of processings are ended (END).

Fig. 20 represents a main part of the processing contents of the update processing of the cache section shown in Figs. 16, 17 and 19. The cache section 28 has a cache control section for controlling the whole cache section 28 and carries out the
20 following processing to update the cache section 28. When the cache control section in the cache section 28 is to store contents in the cache section 28 in response to an instruction sent from the control section 30, it first retrieves that the same contents are stored in the cache section 28 or not (Step S80). When the
25 cache control section detects that the same contents are stored in the cache section 28 (Step S80: Y), it deletes the same contents stored in the cache section 28 (Step S81) and carries out the rotation of the contents (Step S82).

On the other hand, when the cache control section detects that the same contents are not stored in the cache section 28 at the Step S80 (Step S80: N), it is decided whether the contents are stored in all entries of the cache section 28 (Step S83).

5 When it is decided that the contents are stored in all entries (Step S83: Y), the cache control section deletes contents on the head of the cache section 28 (Step S84) and carries out the rotation of the contents (Step S85).

After the rotation of the cache section 28 is carried out at
10 the Steps S82 and S85 or it is decided that the contents are not stored in all the entries of the cache section 28 at the Step S83 (Step S83: N), the cache control section adds the contents requested to be stored by the control section 30 to the end of the cache section 28 (Step S86).

15 In this case, the cache control section decides whether or not a valid term is added to the contents requested to be stored by the control section 30 (Step S87). When it is decided that the valid term is added to the contents requested to be stored by the control section 30, the cache control section (Step S87:
20 Y), the cache control section adds the valid term to the contents finally stored in the cache section 28 (Step S88). On the other hand, when the cache control section decides that the valid term is not added to the contents requested to be stored by the control section 30 at the Step S87 (Step S87: N), "no valid term"
25 is added to the contents finally stored in the cache section 28 (Step S89).

Next, the cache control section decides whether or not a final update date is added to the contents requested to be

stored by the control section 30 (Step S90). If it is decided that the final update date is added to the contents requested to be stored by the control section 30 (Step S90: Y), the cache control section added the final update date to the contents
 5 finally stored in the cache section 28 (Step S91). On the other hand, when the cache control section decides that the final update date is not added to the contents requested to be stored by the control section 30 at the Step S90 (Step S90: N), "no final update date" is added to the contents finally stored in the cache
 10 section 28 (Step S92). Finally, the cache control section adds a current date timed by the timer section 29 as a contents acquisition date to the contents finally stored in the cache section 28 (Step S93) and a series of processings are ended (END).

15 In such a conventional contents acquiring device, the contents server collectively manages the contents data. Therefore, there has been a problem in that it is necessary to carry out a update query with respective update conditions for the contents server as in the Step S49, the Step S57 or the Step
 20 S66 in order to update the contents. Moreover, even if the contents are updated within the valid term in the contents acquiring device. To the contrary, even if the contents stored in the cache section 28 in the contents acquiring device, the contents data are displayed by using the contents data in the
 25 cache section 28 without acquiring the contents. Thus, there has been a problem in that a current version of the contents data collectively managed on the contents server cannot always be read.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a contents acquiring device capable of minimizing an acquisition request for contents data and of acquiring contents data having a current version as much as possible.

A first aspect of the present invention is directed to a contents acquiring device comprising (a) cache means for temporarily storing received contents, (b) acquisition request accepting means for accepting an acquisition request for contents, (c) cache deciding means for deciding whether the contents requested by the acquisition request are stored in the cache means or not, (d) valid expiration setting means for setting a valid expiration as an update expiration of the contents based on a valid term of the contents when it is decided by the cache deciding means that the contents are stored in the cache means, (e) acquisition request transmitting means for transmitting the acquisition request for the contents when the contents are out of the valid expiration set by the valid expiration setting means, and (f) contents receiving means for receiving contents based on the acquisition request transmitted from the acquisition request transmitting means.

According to the first aspect of the present invention, in the contents acquiring device comprising the cache means, it is decided whether or not the contents requested to be acquired are stored in the cache means. If it is decided that the contents requested to be acquired are stored, the acquisition request for the contents requested to be acquired is

transmitted when the contents are out of the valid expiration set based on the valid term of the stored contents. Thus, desirable contents are received.

A second aspect of the present invention is directed to the contents acquiring device according to the first aspect of the present invention, further comprising valid term holding means for previously holding a valid term, and valid term addition deciding means for deciding whether the valid term is added to the contents or not when it is decided by the cache deciding means that the contents are stored in the cache means, the valid expiration setting means serving to set the valid expiration based on a valid term held by the valid term holding means when it is decided by the valid term addition deciding means that the valid term is not added.

According to the second aspect of the present invention, when the valid term of the contents stored in the cache means is not added, the valid expiration is set by using the valid term previously held.

A third aspect of the present invention is directed to a method of acquiring contents comprising the steps of (a) accepting means for accepting an acquisition request for contents, (b) deciding whether or not the contents requested by the acquisition request accepted at the acquisition request accepting step are stored in a cache for temporarily storing received contents, (c) setting a valid expiration as an update expiration of the contents based on a valid term added to the contents when it is decided at the cache deciding step that the contents are stored in the cache, (d) transmitting the

acquisition request for the contents when the contents are out of the valid expiration set at the valid expiration setting step, and (e) receiving contents corresponding to the acquisition request transmitted at the acquisition request transmitting
5 step.

According to the third aspect of the present invention, the contents acquisition request is accepted at the acquisition request step and it is decided at the cache deciding step whether the contents requested by the acquisition request
10 accepted at the cache deciding step are stored in the cache or not. When it is decided that the same contents are stored, the valid expiration is set based on the valid term added to the contents stored in the cache at the valid expiration setting step. When the contents are not within the set valid expiration at the
15 present time, the contents acquisition request is transmitted at the acquisition request transmitting step and corresponding contents are received at the contents receiving step.

A fourth aspect of the present invention is directed to the method of acquiring contents according to the third aspect of
20 the present invention, further comprising the step of deciding whether the valid term is added to the contents or not when it is decided at the cache deciding step that the contents are stored in the cache, the valid expiration setting step serving to set the valid expiration based on a previously held valid term
25 when it is decided at the valid term addition deciding step that the valid term is not added.

According to the fourth aspect of the present invention, when it is decided at the cache deciding step that the contents

are stored in the cache, it is decided at the valid term addition deciding step whether the valid term is added to the contents stored in the cache or not. When it is decided that the valid term is not added, the valid expiration is set based on the valid term previously held at the valid expiration setting step.

Consequently, the optimum contents acquisition request can also be carried out for the contents received from an existing contents server in accordance with a parameter of the valid term.

10 A fifth aspect of the present invention is directed to a contents server comprising (a) contents storing means for previously storing contents, (b) acquisition request receiving means for receiving an acquisition request transmitted when the contents are out of a valid expiration to be an update expiration of the contents stored in a cache which are set based on a valid term of the contents, and (c) contents transmitting means for fetching the contents requested by the acquisition request received by the acquisition request receiving means from the contents storing means and for transmitting the contents to a destination of the acquisition request.

According to the fifth aspect of the present invention, the transmitted acquisition request is received only when the contents are not within the valid expiration set based on the valid term of the contents stored in the cache, and corresponding contents are fetched from prestored contents in the contents server and are transmitted to the destination of the acquisition request.

A sixth aspect of the present invention is directed to the

contents server according to the fifth aspect of the present invention, wherein the valid expiration is set based on a valid term previously held in the destination of the acquisition request when the valid term is not added to the contents stored
 5 in the cache.

According to the sixth aspect of the present invention, when the valid term is not added to the contents stored in the cache, the valid expiration is set based on the valid term previously held in the destination of the acquisition request.
 10 Consequently, it is not necessary to give a parameter of the valid term to all the contents prestored on the contents server side. Thus, existing equipment can be applied.

A seventh aspect of the present invention is directed to a contents acquiring system comprising (a) a contents acquiring
 15 device for transmitting an acquisition request of contents to be an acquisition request object prestored through a network when the contents are out of a valid expiration to be an update expiration of the contents set based on a valid term of the contents and for receiving contents corresponding thereto, and
 20 (b) a contents server for reading contents corresponding to an acquisition request transmitted from the contents acquiring device from contents in various fields which are prestored, and for transmitting the contents corresponding to the acquisition request to the contents acquiring device through the network.

25 According to the seventh aspect of the present invention, in the contents acquiring device, the acquisition request of the contents to be a prestored acquisition request object is transmitted through the network when the contents are not

within the valid expiration set based on the valid term of the contents, the contents corresponding to the acquisition request transmitted from the contents acquiring device are read from the contents in various fields prestored in the contents server
 5 and are returned through the network. Consequently, a traffic on the network can be relieved and a large number of contents acquisition requests can be processed.

An eighth aspect of the present invention is directed to the contents acquiring system according to the seventh aspect
 10 of the present invention, wherein the valid expiration is set based on a predetermined valid term previously held when a valid term is not added to the contents to be an acquisition object.

According to the eighth aspect of the present invention,
 15 the valid expiration is set based on a predetermined valid term previously held when a valid term is not added to the contents to be an acquisition object. Consequently, an existing device can be applied to reduce an equipment investment and to minimize the acquisition request. Thus, it is possible to
 20 provide a comfortable contents service for a user to request the contents acquisition.

A ninth aspect of the present invention is directed to a contents acquiring system comprising (a) a contents acquiring device including cache means for temporarily storing received
 25 contents, acquisition request accepting means for accepting an acquisition request for contents, cache deciding means for deciding whether the contents requested by the acquisition request are stored in the cache means or not, valid expiration

setting means for setting a valid expiration as an update expiration of the contents based on a valid term added to the contents when it is decided by the cache deciding means that the contents are stored in the cache means, acquisition request
 5 transmitting means for transmitting the acquisition request for the contents when the contents are out of the valid expiration set by the valid expiration setting means, and contents receiving means for receiving contents based on the acquisition request transmitted from the acquisition request
 10 transmitting means, and (b) a contents server including contents storing means for previously storing contents, acquisition request receiving means for receiving an acquisition request transmitted from the acquisition request transmitting means, and contents transmitting means for
 15 fetching the contents requested by the acquisition request received by the acquisition request receiving means from the contents storing means and for transmitting the contents to the acquisition request.

According to the ninth aspect of the present invention, in
 20 the contents acquiring device comprising the cache means, it is decided by the cache deciding means whether or not the contents to be an acquisition request object accepted by the acquisition request accepting means is stored in the cache means. When it is decided that the same contents are stored
 25 in the cache means, the valid expiration is set based on the valid term added to the stored contents by the valid expiration setting means, and the acquisition request of the contents is transmitted to the contents server only when the contents are

not within the valid expiration at the present time. The contents server prestores the contents, and fetches the contents requested by the acquisition request from the contents storing means and transmits the same contents to the contents
 5 acquiring device. The contents acquiring device receives the contents transmitted from the contents server.

A tenth aspect of the present invention is directed to the contents acquiring system according to the ninth aspect of the present invention, further comprising valid term holding
 10 means for previously holding a valid term, and valid term addition deciding means for deciding whether the valid term is added to the contents or not when it is decided by the cache deciding means that the contents are stored in the cache means, the valid expiration setting means serving to set the valid
 15 expiration based on a valid term held by the valid term holding means when it is decided by the valid term addition deciding means that the valid term is not added.

According to the tenth aspect of the present invention, when the valid term of the contents stored in the cache mean is
 20 not added, the valid expiration is set by using the valid term previously held. Consequently, it is possible to minimize the acquisition request for the contents data from the contents acquiring device and to acquire the contents data having a current version as much as possible irrespective of the presence
 25 of the addition of a parameter of the valid term to the contents in the contents acquiring system.

Fig. 1 is a diagram showing the summary of a structure of a contents acquiring system to which a contents acquiring device is applied,

Fig. 2 is a block diagram showing the schematic structure of the contents acquiring device,

Fig. 3 is a flow chart showing the whole summary of the processing contents of a contents acquisition processing to be carried out by the contents acquiring device according to the present embodiment,

Fig. 4 is a flow chart showing a part of the summary of the processing contents of the contents acquisition processing to be carried out by the contents acquiring device according to the present embodiment in Fig. 3,

Fig. 5 is a flow chart showing a part of the summary of the processing contents of the contents acquisition processing to be carried out by the contents acquiring device according to the present embodiment in Fig. 3,

Fig. 6 is a flow chart showing a part of the summary of the processing contents of the contents acquisition processing to be carried out by the contents acquiring device according to the present embodiment in Fig. 3,

Fig. 7 is a flow chart showing a part of the summary of the processing contents of the contents acquisition processing to be carried out by the contents acquiring device according to the present embodiment in Fig. 3,

Fig. 8 is a flow chart showing a first part of the summary of the processing contents of an update processing of a cache section in the contents acquiring device according to the

present embodiment,

Fig. 9 is a flow chart showing a second part of the summary of the processing contents of an update processing of a cache section in the contents acquiring device according to the present embodiment,

Fig. 10 is a sequence diagram showing a data flow in each section when contents data are successfully acquired from a contents server if the cache section has no contents in a contents acquiring system to which the contents acquiring device according to the present embodiment is applied,

Fig. 11 is a sequence diagram showing a data flow in each section when the acquisition of contents data from a contents server is failed if the cache section has no contents in a contents acquiring system to which the contents acquiring device according to the present embodiment is applied,

Fig. 12 is a sequence diagram showing a data flow in each section when the contents are present in the cache section and a current date is set within a valid term in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied,

Fig. 13 is a sequence diagram showing a data flow in each section when the contents are present in the cache section, a current date is set out of the valid term and contents data are successfully acquired from the contents server in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied,

Fig. 14 is a sequence diagram showing a data flow in each section when the contents are present in the cache section, a

current date is set out of the valid term and the acquisition of the contents data from the contents server is failed in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied,

5 Fig. 15 is a flow chart showing the summary of processing contents in a conventional contents acquiring device,

 Fig. 16 is a flow chart showing the whole summary of the processing contents of a contents acquisition processing to be carried out by the conventional contents acquiring device,

10 Fig. 17 is a flow chart showing a part of the summary of the processing contents of the content acquisition processing to be carried out by the conventional contents acquiring device in Fig. 16,

 Fig. 18 is a flow chart showing a part of the summary of
15 the processing contents of the processing acquisition processing to be carried out by the conventional contents acquiring device in Fig. 16,

 Fig. 19 is a flow chart showing a part of the summary of the processing contents of the processing acquisition
20 processing to be carried out by the conventional contents acquiring device in Fig. 16,

 Fig. 20 is a flow chart showing a first part of the summary of the processing contents of an update processing of a cache section in the conventional contents acquiring device,
25 and

 Fig. 21 is a flow chart showing a second part of the summary of the processing contents of the update processing of the cache section in the conventional contents acquiring device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be described
5 below.

Fig. 1 shows an example of the summary of the structure
of a contents acquiring system to which a contents acquiring
device according to the present embodiment is applied. As
described above, the contents acquiring system comprises a
10 contents acquiring device group 15 including a personal
computer 10, a PDA 11, a laptop computer 13 having a mobile
communication terminal 12 such as a PHS or a portable
telephone connected as a communication interface apparatus, a
portable telephone 14 having a browser function and the like, a
15 contents server group 17 including first to Nth contents servers
16₁ to 16_N for storing various contents data in a variety of fields
are connected through a network 18 including a public
communication network or a leased line.

In each contents acquiring device of the contents
20 acquiring device group according to the present embodiment,
preconfirmation is carried out with the update of the contents
in the contents acquiring device by using a valid term
previously held in the device or a valid term added at the time
of the contents data acquisition from the contents server group
25 so that a contents data acquisition request for the contents
server group can be minimized.

More specifically, the contents acquiring device
according to the present embodiment decides whether or not a

contents acquisition request is to be transmitted from a device user to the contents acquisition request by using the valid term previously held in the device or the valid term added at the time of the contents data acquisition from the contents server group. Herein, it is decided whether or not the contents requested to be acquired are stored in a cache section provided in the contents acquiring device. If the contents are not stored, a contents acquisition request is transmitted to the contents server. On the other hand, when the contents requested to be acquired are stored in the cache section, it is decided whether or not the valid term of the contents of the cache section or the valid term is set before a contents acquisition request date and a contents acquisition request is transmitted to the contents server if the valid term is set before the acquisition request date.

When the contents server receives the contents acquisition request from the contents acquiring device through the network infra, it fetches contents data corresponding thereto and transmits the same contents data to the contents acquiring device. In the contents acquiring device, if it is decided that the contents acquisition request is to be transmitted from the device user to the contents server, the contents data received corresponding to the acquisition request transmitted to the contents server are displayed on the display section. On the other hand, if it is decided that the contents acquisition request does not need to be transmitted to the contents server, the contents data stored in the cache section in the contents acquiring device are displayed on the display

section without transmitting an acquisition request to the contents server.

Each contents acquiring device in the contents acquiring device group 15 is constituted by each section shown in Fig. 2.

5 More specifically, the contents acquiring device according to the present embodiment comprises an input section for accepting various requests sent from a device user, an external input/output section having an interface function together with the network infra, a display section such as a liquid crystal
10 display (LCD) for displaying contents data acquired by the external input/output section, a cache section for temporarily storing the contents data, a timer section for timing an update time of the contents data stored in the cache section, and a control section for controlling each section of the device.

15 The control section has a central processing unit (CPU) which is not shown, and can execute the above-mentioned various control operations in accordance with a control program stored in a predetermined storage device such as a read only memory (ROM) which is not shown.

20 Since the summary of the processing of the contents acquiring device according to the present embodiment is the same as that in Fig. 15, description will be omitted. The contents acquiring device according to the present embodiment has different processing contents based on a contents
25 acquisition processing control program stored in a memory (not shown) in the control section therein.

The network infra and the contents server are well known to the skilled in the art and the detailed description of

the structure and operation will be omitted.

Figs. 3 to 7 show the summary of processing contents of a control program to be executed by the contents acquiring device according to the present embodiment. The control section

5 analyzes the request for contents acquisition which is accepted by the input section 25 and gives an instruction of the contents acquisition request to the display section. The display

section displays the contents acquisition request in accordance with the instruction sent from the control section. The

10 control section specifies the requested contents data, and retrieves the cache section to decide whether or not there are the requested contents data (Step S100). When it is decided that there are not the contents data requested to be acquired by the cache section (Step S100: N), an instruction for

15 transmitting a request for acquiring the contents data is given to the external input/output section (Step S101). The external input/output section transmits a contents acquisition request through the network infra to the contents server for storing contents data acquired and requested.

20 The external input/output section monitors the normal receipt of the contents data from the contents server to be a contents request destination through the network infra, and transfers the received contents data to the control section when detecting the normal receipt. When the control section

25 acquires the contents data normally received by the external input/output section (Step S102: Y), it updates the cache section by using the acquired contents (Step S103) and gives an instruction for displaying the received contents to the display

section (Step S104). The display section displays the received contents in response to the instruction given from the control section. Then, a series of processings are ended (End).

On the other hand, when the external input/output
 5 section cannot receive the contents data from the contents server to be the acquisition request destination through the network infra and the control section cannot acquire the contents data (Step S102: N), the control section deletes the contents stored in the cache section and gives the display
 10 section an instruction to display of contents acquisition failure (Step S105). For example, when the contents data requested from the contents server cannot be acquired within a constant time corresponding to the contents acquisition request transmitted from the external input/output section or when the
 15 contents data requested to be acquired in the contents server cannot be found or there are no contents data requested to be acquired, the above-mentioned processing is carried out. At that time, the display section gives an instruction of the contents acquisition failure in response to the instruction sent
 20 from the control section. Then, a series of processings are ended (END).

When it is decided that the cache section has the contents data required to be acquired at the Step S100 (Step S100: Y), the control section decides whether or not a valid term is added
 25 to the contents data requested to be acquired which are stored in the cache section (Step S106). The valid term is added when the contents are acquired from the contents server.
 When it is decided that the valid term is added to the contents

data requested to be acquired which are stored in the cache section (Step S106: Y), the valid term is compared with the valid term previously held in the contents acquiring device (Step S107). When the valid term of the contents data in the cache section is smaller than the valid term held in the device (Step S107: Y), the control section makes the valid term of the contents data in the cache section valid (Step S108). When the valid term of the contents data in the cache section is equal to or more than the valid term held in the device (Step S107: N), the valid term previously held in the contents acquiring device is made valid (Step S109).

Moreover, when it is decided that the valid term is not added to the contents data requested to be acquired which are stored in the cache section at the Step S106 (Step S106: N), the valid term previously held in the contents acquiring device is made valid (Step S109).

After the valid term of the contents in the cache section or the valid term previously held in the contents acquiring device is made valid at the Steps S108 and S109, it is decided whether or not the valid term is added to the contents data requested to be acquired which are stored in the cache section (Step S110). The valid term is previously added by the contents server or added during acquisition from the contents server, for example. When it is decided that the valid term is added to the contents stored in the cache section (Step S110: Y), the control section decides whether or not a final update date is added to the contents stored in the cache section (Step S111). The final update date is added during the acquisition of the

contents. When it is decided that the final update date is added to the contents stored in the cache section (Step S111: Y), the valid term made valid at the Step S108 or S109 is added to the final update date of the contents stored in the cache section
 5 and a "final update valid date" expressed in Equation (1) is calculated.

$$(\text{Final update valid date}) = (\text{final update date}) + (\text{valid term})$$

10 ... (1)

Subsequently, the control section compares the final update valid date thus calculated with a contents acquisition date of the contents stored in the cache section (Step S112).
 15 When the final update valid date is smaller than the contents acquisition date of the contents stored in the cache section (Step S112: Y), the control section compares the valid term of the contents stored in the cache section with the final update valid date thus calculated (Step S113). When the valid term
 20 of the contents stored in the cache section is smaller than the final update valid date (Step S113: Y), the control section makes the valid term of the contents stored in the cache section valid (Step S114). When the valid term of the contents stored in the cache section is equal to or greater than the final update
 25 valid date at the Step S113 (Step S113: N), the control section sets the calculated final update valid date to be a valid term (Step S115).

When the final update valid date is equal to or greater

than the contents acquisition date of the contents stored in the cache section (Step S112: N), the control section adds the valid term made valid at the Step S108 or the Step S109 to the contents acquisition date of the contents stored in the cache section and a "contents acquisition valid date" expressed in
 5 Equation (2) is calculated.

$$\begin{aligned} (\text{Contents acquisition valid date}) &= (\text{contents acquisition date}) \\ &+ (\text{valid term}) \qquad \qquad \qquad \dots \quad (2) \end{aligned}$$

10

Subsequently, the control section compares the contents acquisition valid date thus calculated with the valid term of the contents stored in the cache section (Step S116). When the valid term of the contents stored in the cache section is
 15 smaller than the contents acquisition valid date (step S116: Y), the control section makes the valid term of the contents stored in the cache section valid (Step S117). When the valid term of the contents stored in the cache section is equal to or greater than the contents acquisition valid date (Step S116: N), the
 20 control section makes the calculated contents acquisition valid date valid (Step S118).

When it is decided that the valid term is not added to the contents stored in the cache section at the Step S110 (Step S110: N), the control section decides whether or not the final
 25 update date is added to the contents stored in the cache section (Step S119). When it is decided that the final update date is added to the contents stored in the cache section (Step S119: Y), the control section compares the contents acquisition valid date

calculated in the same manner as in the Equation (2) with the final update valid date calculated in the same manner as in the Equation (1) (Step S120). When the contents acquisition valid date is smaller than the final update valid date (Step S120: Y),
 5 the control section makes valid the contents acquisition valid date obtained as a valid expiration by adding the valid term valid for the contents acquisition date of the contents stored in the cache section (Step S121). When the contents acquisition valid date is equal to or greater than the final update valid
 10 date (Step S120: N), the control section makes valid the final update valid date obtained as a valid expiration by adding the valid term valid for the final update date of the contents stored in the cache section (Step S122).

On the other hand, it is decided that the final update
 15 date is not added to the contents stored in the cache section at the Step S119 (Step S119: N), the control section makes valid the contents acquisition valid date obtained as a valid expiration by adding the valid term valid for the contents acquisition date stored in the cache section (Step S123).

20 At the Step S111, moreover, it is decided that the final update is not added to the contents stored in the cache section (Step S111: N), the control section compares the valid expiration of the contents stored in the cache section with the contents acquisition valid date calculated in the same manner
 25 as in the Equation (2) (Step S124). When the valid expiration of the contents stored in the cache section is smaller than the calculated contents acquisition valid date (Step S124: Y), the control section makes the valid expiration stored in the cache

section valid (Step S125). When the valid expiration of the contents stored in the cache section is equal to or greater than the calculated contents acquisition valid date (Step S124: N), the control section makes the calculated contents acquisition
 5 valid date valid as a valid expiration (Step S126).

When the valid expiration is set at any of the Steps S114, S115, S117, S118, S121 to S123, S125 and S126, the control section decides whether or not a current date timed by the timer section in the device passes the valid expiration added to
 10 the contents (Step S127). When it is decided that the current time obtained by the timer section is out of the valid expiration added to the contents (Step S127: N), the control section gives an instruction for transmitting a contents acquisition request to the external input/output section (Step S128). The
 15 external input/output section transmits the contents acquisition request to the contents server through the network infra in response to the instruction sent from the control section.

The external input/output section monitors the normal receipt of the contents data from the contents server to be a contents request destination through the network infra, and transfers the received contents data to the control section when detecting the normal receipt. When the control section acquires the contents data normally received by the external
 20 input/output section (Step S129: Y), it updates the cache section only if the acquired contents are updated (Step S130: Y, Step S131) and gives an instruction for displaying the received contents to the display section (Step S132). The display

section displays the received contents in response to the instruction given from the control section. When the acquired contents are not updated, the cache section is not updated (Step S130: N, Step S131) and exactly gives an instruction for
 5 displaying the received contents to the display section (Step S132). Then, a series of processings are ended (END).

When the external input/output section cannot receive the contents data from the contents server to be an acquisition request destination through the network infra and the control
 10 section cannot acquire the contents data at the Step S129 (Step S129: N), the control section deletes the contents stored in the cache section (Step S133) and gives an instruction for displaying a contents acquisition failure to the display section (Step S134). This operation is carried out when the contents
 15 data requested from the contents server for a constant time cannot be acquired corresponding to the contents acquisition request transmitted from the external input/output section, for example, or when the contents data requested to be acquired in the contents server cannot be found or there are no contents
 20 data requested to be acquired. At that time, the display section displays indication of a contents acquisition failure in response to the instruction sent from the control section. Then, a series of processings are ended (END).

When it is decided that the current time obtained by the
 25 timer section does not expire the valid term added to the contents at the Step S127 (Step S127: Y), the control section fetches the contents from the cache section 28 (Step S135) and gives an instruction for transmitting a contents acquisition

request to the display section (Step S136). The display section displays the fetched contents in response to the instruction sent from the control section. Then, a series of processings are ended (END).

5 Fig. 8 represents a main part of the processing contents of the update processing of the cache section shown in Figs. 3 and 7. The cache section has a cache control section for controlling the whole cache section and carries out the following processing to update the cache section. When the
10 cache control section in the cache section is to store contents in the cache section in response to an instruction sent from the control section, it first retrieves that the same contents are stored in the cache section or not (Step S140). When the cache control section detects that the same contents are stored in the
15 cache section (Step S140: Y), it deletes the same contents stored in the cache section (Step S141) and carries out the rotation of the contents (Step S142). The rotation serves to change the arrangement of the contents stored in the cache section in order of acquisition, and the contents stored finally
20 in the cache section are the most newly acquired contents on a time basis.

On the other hand, when the cache control section detects that the same contents are not stored in the cache section at the Step S140 (Step S140: N), it is decided whether the contents
25 are stored in all entries of the cache section (Step S143). When it is decided that the contents are stored in all entries (Step S143: Y), the cache control section deletes contents on the head of the cache section (Step S144) and carries out the

rotation of the contents (Step S145).

After the rotation of the cache section is carried out at the Steps S142 and S145 or it is decided that the contents are not stored in all the entries of the cache section at the Step
 5 S143 (Step S143: N), the cache control section adds the contents requested to be stored by the control section to the end of the cache section (Step S146).

In this case, the cache control section decides whether or not a valid term is added when the contents requested to be
 10 stored by the control section are acquired (Step S147). When it is decided that the valid term is added (Step S147: Y), the cache control section adds the valid term added to the contents requested to be stored by the control section to the contents stored finally in the cache section (Step S148). On the other
 15 hand, when the control section decides that the valid term is not added to the contents requested to be stored by the control section at the Step S147 (Step S147: N), the cache control section adds "no valid term" to the contents stored finally in the cache section 28 (Step S149).

20 Next, the cache control section decides whether or not a valid expiration is added when the contents requested to be stored by the control section are acquired (Step S150). When it is decided that the valid expiration is added (Step S150: Y), the cache control section adds the valid expiration added to the
 25 contents requested to be stored by the control section to the contents stored finally in the cache section (Step S151). On the other hand, when the control section decides that the valid expiration is not added to the contents requested to be stored

by the control section at the Step S150 (Step S150: N), the cache control section adds "no valid expiration" to the contents stored finally in the cache section (Step S152).

Then, the cache control section decides whether or not a final update date is added to the contents when the contents requested to be stored by the control section are acquired (Step S153). When it is decided that the final update date is added to the contents requested to be stored by the control section (Step S153: Y), the cache control section adds the final update date to the contents stored finally in the cache section (Step S154). On the other hand, when the control section decides that the final update date is not added to the contents requested to be stored by the control section at the Step S153 (Step S153: N), the cache control section adds "no final update date" to the contents stored finally in the cache section (Step S155). Finally, the cache control section adds the current date timed by the timer section as the contents acquisition date to the contents stored finally in the cache section (step S156), and a series of processings are ended (End).

Next, the operation of the contents acquiring device according to the present embodiment will be described specifically.

Fig. 10 shows a data flow in each section in the case in which contents are not present in the cache section and the acquisition of the contents data from the contents server is successful in a contents acquiring system to which the contents acquiring device according to the present embodiment is applied. More specifically, when an acquisition request 160 is

given from the user of the contents acquiring device through the input section, information indicative of the acquisition request is sent to the control section (acquisition request notice 161). The control section analyses the indication information and gives an instruction for display to the display section when the result of the analysis is the contents acquisition request (acquisition notice 162). The control section retrieves the cache section based on the analyzed contents acquisition request (retrieval 163). Assuming that there are not contents in the cache section, the control section receiving a "no contents" 164 as the result of the retrieval of the cache section gives an instruction for a transmission 165 of the contents acquisition request to the external input/output section. The external input/output section transmits a contents acquisition request 166 to the contents server, and monitors the receipt of contents data 167 requested to be acquired.

When receiving the contents data requested to be acquired, the external input/output section gives a notice to the control section as received contents data 168. The control section adds a valid term, a valid expiration, a final update date and a contents acquisition date to the received contents as shown in Figs. 8 and 9 and gives an instruction for storage to the cache section (storage 169), and gives the display section an instruction for displaying the received contents data (display 170).

Fig. 11 shows a data flow in each section in the case in which contents are not present in the cache section and the acquisition of the contents data from the contents server is

failed in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied. The same data as those in the case in which the contents data acquisition is successful as shown in Fig. 10 have the same reference numerals and description thereof will be omitted. More specifically, after the contents acquisition request 166 is transmitted to the contents server by the external input/output section based on the acquisition request 160 input from the user of the contents acquiring device through the input section, the receipt of the contents data 167 requested to be acquired is monitored.

When the contents data requested from the contents server cannot be acquired for a constant time corresponding to the transmitted contents acquisition request or the contents data requested to be acquired cannot be found or are not present in the contents server, for example, the external input/output section gives an instruction for a contents acquisition failure display 177 to the display section as described in the Step S105 shown in Fig. 3 if a message of the contents acquisition failure is given as a contents acquisition failure notice 176 to the control section based on a contents acquisition failure message 175 given from the contents server.

Fig. 12 shows a data flow in each section in the case in which contents are present in the cache section and the current date is within the valid term in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied. The same data as those in the case in which the contents data acquisition is successful as shown in

Fig. 10 have the same reference numerals and description thereof will be omitted. More specifically, the cache retrieval 163 is transmitted to the cache section based on the acquisition request 160 input from the user of the contents acquiring device through the input section and a notice 180 indicative of the presence of the contents is received correspondingly.

After a valid term and a valid expiration are set as shown in Figs. 3 to 6, an instruction for a contents fetch 181 is given to the cache section as described in the Step S135 shown in Fig. 7 when it is decided that the current date is within the valid term. When the contents corresponding to the contents fetch request are received from the cache section (contents receipt 182), an instruction for a display 183 for the contents data received is given to the display section.

Fig. 13 shows a data flow in each section in the case in which contents are present in the cache section, the current date is out of the valid term and the contents data acquisition from the contents server is successful in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied. The same data as those in the case in which the contents data acquisition is successful as shown in Fig. 10 have the same reference numerals and description thereof will be omitted. More specifically, the cache retrieval 163 is transmitted to the cache section based on the acquisition request 160 input from the user of the contents acquiring device through the input section and a notice 185 indicative of the presence of the contents is received correspondingly. After a valid term and a valid expiration are

set as shown in Figs. 3 to 6, an instruction for a contents acquisition request transmission 186 is first given to the external input/output section as described in the Steps S128 to S132 shown in Fig. 7 when it is decided that the current date is
 5 out of the valid term. The external input/output section transmits a contents acquisition request 187 through the network infra and monitors the receipt of the contents data requested to be acquired.

When receiving the contents data 188 requested to be
 10 acquired, the external input/output section gives a notice to the control section as received contents data 189. If the received contents are updated in the contents server, the control section adds a valid term, a valid expiration, a final update date and a contents acquisition date to the cache section as shown in Figs.
 15 8 and 9, carries out an update 190 of the cache section and gives the display section an instruction for display of the received contents data (display 191).

Fig. 14 shows a data flow in each section in the case in which contents are present in the cache section, the current
 20 date is out of the valid term and the acquisition of the contents data from the contents server is failed in the contents acquiring system to which the contents acquiring device according to the present embodiment is applied. The same data as those in the case in which the contents data acquisition
 25 is successful as shown in Fig. 13 have the same reference numerals and description thereof will be omitted. More specifically, after the notice 185 indicative of the presence of the contents is received corresponding to the cache retrieval

163 transmitted to the cache section and a valid term and a valid expiration are set as shown in Figs. 3 to 6 based on the acquisition request 160 input from the user of the contents acquiring device through the input section, the instruction for the contents acquisition request transmission 186 is first given to the external input/output section as described in the Steps S128 to S132 shown in Fig. 7 when it is decided that the current date is out of the valid term. The external input/output section transmits the contents acquisition request 187 through the network infra and monitors the receipt of the contents data requested to be acquired.

When the contents data requested from the contents server cannot be acquired for a constant time corresponding to the transmitted contents acquisition request or the contents data requested to be acquired cannot be found or are not present in the contents server, for example, the external input/output section transmits a corresponding contents deleting instruction 197 to the cache section and gives an instruction for a contents acquisition failure display 198 to the display section as described in the Step S133 shown in Fig. 7 if a message of the contents acquisition failure is given as a contents acquisition failure notice 196 to the control section based on a contents acquisition failure message 195 given from the contents server.

In the contents acquiring device according to the present embodiment, thus, a parameter of the valid term of the contents is provided, the valid term is newly used to previously decide in the device whether or not the contents are to be updated, and

an acquisition request to be an access to the contents server storing the contents data requested to be acquired through the network infra is then transmitted. Consequently, in the case in which the contents requested to be acquired is particularly present in the cache section, the access to the contents server can be suppressed based on the valid term of the contents and an access time required for the use of the contents in the cache section can be reduced. Correspondingly, an unnecessary load is not applied to the network infra and a throughput in the network can be enhanced. Moreover, the parameter of the valid term is provided in the contents acquiring device itself. Consequently, even if the valid term is not added when the contents data stored in the contents server are acquired, it can be previously decided in the device whether or not the contents are to be updated based on the valid term previously held in the device. Thus, the present invention can be applied to the conventional contents acquiring system.

Although there has been described the contents acquiring device according to the present embodiment which serves to decide based on the "day" whether the contents are to be updated or not, this is not restricted. For example, the decision may be carried out based on a "date".

According to the first or third aspect of the present invention, as described above, in the case in which the contents requested to be acquired are in the cache section, an access to the contents server can be controlled based on the valid term of the contents, and an access time required for using the contents in the cache section can be reduced. Correspondingly, an

unnecessary load is not applied to the network infra and a throughput in the network can be enhanced.

According to the second or fourth aspect of the present invention, furthermore, the parameter of the valid term is
5 provided in the contents acquiring device itself.

Consequently, even if the valid term is not added when the contents data stored in the contents server are acquired, it can be previously decided in the device whether or not the contents are to be updated based on the valid term previously held in the
10 device. Thus, the present invention can be applied to a conventional contents acquiring system.

According to the fifth aspect of the present invention, it is sufficient that the contents are fetched and returned for the acquisition request transmitted only when the contents are not
15 within the valid expiration set based on the valid term of the contents stored in the cache. Therefore, a processing load in the contents server can also be reduced considerably. Thus, it is possible to provide a comfortable contents service for the user.

20 According to the sixth aspect of the present invention, furthermore, when the valid term is not added to the contents stored in the cache, the valid expiration is set based on the valid term previously held in the destination of the acquisition request. Consequently, it is not necessary to give the
25 parameter of the valid term to all the contents previously stored on the contents server side, and existing equipment can be applied.

According to the seventh to tenth aspects of the present

invention, a traffic on the network can be relieved and a large number of contents acquisition request can be processed.

According to the eighth or tenth aspect of the present invention, particularly, when the valid term is not set to the contents to be

an acquisition object, the valid expiration is set based on a predetermined valid term previously held. Consequently, an existing device is applied to reduce an equipment investment and the acquisition request can be minimized. Thus, it is possible to provide a comfortable contents service for the user to request the contents acquisition.

10 to request the contents acquisition.